REMARKS

Claims 12-13, 18-19, 21-22, 24-25, 27, 29, 31, 33 and 35 are currently pending in the present application.

Claim 12 has been amended to more particularly point out and distinctly claim various embodiments of Applicants' invention wherein the surface of the ion exchange membrane comprises a layer of the perfluorosulfonic acid polymer with a support member embedded therein. Support for the amendments to claim 12 can be found in the Specification and the previously pending claims, for example, claims 15 and 16. Claims 33 and 35 have been amended for consistency in conjunction with the amendments to claim 12. No new matter is introduced by the amendments made herein. A complete listing of all claims ever presented is set forth herein in accordance with 37 C.F.R. §1.121 (c)(1). Entry of the amendments made herein, in conjunction with the RCE submitted herewith, is respectfully requested.

At the outset, Applicants would like to address a recurring issue presented by the Examiner in the final Office Action. The Examiner notes that "the process limitations of pressure and temperature are not given any patentable weight in a product claim . . .." (*See, e.g.*, the final Office Action, p. 6, lines 5-6). Applicants respectfully submit that the Examiner misinterprets the referenced claim language.

Various embodiments of Applicant's claimed invention are directed to electrochemical cells for electrolysis of an aqueous solution of hydrogen chloride, which comprise: (a) an anode half-cell comprising an anode; (b) a cathode half-cell comprising a gas diffusion electrode as the cathode; and (c) an ion exchange membrane comprising a perfluorosulfonic acid polymer which is positioned between (a) and (b); wherein the gas diffusion electrode has a surface having a geometric area, and wherein the ion exchange membrane has a surface having a geometric area, the surface of the ion exchange membrane comprises a layer of the perfluorosulfonic acid polymer with a support member embedded therein, ***and wherein*** the surface of the gas diffusion electrode and the surface of the ion exchange membrane are adjacent to each other and, ***at a pressure of 250 g/cm^2 and a temperature of 60°C***, the gas diffusion electrode and the ion exchange membrane have a contact

area of at least 50% of their geometric area. The references to pressure and temperature are NOT process limitations, but rather the "conditions" at which the claimed contact area is "at least 50%."

In the final Office Action, the Examiner rejects claims 12-13 and 31 under 35 U.S.C. §103(a), as being unpatentable over European Pat. Pub. No. EP 0785294 of DeNora ("DeNora"). Additionally, in the final Office Action, the Examiner rejects claims 12-13 and 31 under 35 U.S.C. §103(a), as being unpatentable over U.S. Pat. No. 6,042,702 of Kolouch, *et al.* ("Kolouch"). Claim 15 does not stand rejected as obvious over either DeNora or Kolouch. While not necessarily agreeing with the Examiner's rejections of claims 12-13 and 31 on the basis of DeNora or Kolouch, nor any of the arguments and contentions set forth in support thereof, in an effort to expedite prosecution of various preferred embodiments, Applicants have amended claim 12 to incorporate the subject matter of previously pending claim 15. Accordingly, the Examiner's rejections based on DeNora and Kolouch are moot. Withdrawal of these rejections is respectfully requested.

In the final Office Action, the Examiner rejects claims 12, 13, 15, 16, 31, 33 and 35 under 35 U.S.C. §103(a), as being unpatentable over U.S. Pat. No. 5,766,429 of Shimamune, *et al.* ("Shimamune"). Additionally, in the final Office Action, the Examiner rejects claims 12, 13, 15, 16, 18, 19, 21, 22, 24, 25, 27, 29, 31, 33 and 35 under 35 U.S.C. §103(a), as being unpatentable over U.S. Patent No. 4,526,663 of Yoshida, *et al.* ("Yoshida"). Applicants respectfully traverse the Examiner's rejections based on Shimamune and Yoshida and the arguments and contentions set forth in support thereof as they apply to the subject matter of amended claim 12 (which now incorporates canceled claim 15).

As mentioned above, various embodiments of Applicants' claimed invention are directed to electrochemical cells for electrolysis of an aqueous solution of hydrogen chloride wherein the ion exchange membrane has a surface having a geometric area, the surface of the ion exchange membrane comprises a layer of the perfluorosulfonic acid polymer with a support member embedded therein, and wherein the surface of the gas diffusion electrode and the surface of the ion exchange membrane are adjacent to each other and possess the claimed contact area of

at least 50% at the recited pressure and temperature conditions. As shown in Applicants' Specification, this is a significant improvement over the prior art. Moreover, as shown in Applicants' Specification, ***with embedded support ion exchange membranes***, the claimed contact area of at least 50% is not implicit merely by pressing or otherwise. Applicants respectfully submit that Shimamune and Yoshida fail to teach or suggest each and every element of Applicants' claimed invention, and further submit that there is no reason one of ordinary skill in the art would be motivated to modify Shimamune or Yoshida to arrive at Applicants' claimed invention.

As noted in Applicants' Specification, when ion exchange membranes having flat support structures are employed in electrolysis cells with a gas diffusion electrode, relatively high operating voltages, *e.g.*, 1.25 to 1.3 V at 5 kA/m^2, are required. (*See, e.g.*, Applicants' Spec., p. 1, lines 21-27). However, when the claimed combination of Applicants' invention is employed such that a contact area of at least 50%, at the recited temperature and pressure conditions, is provided, significant improvement in operating voltage is achieved. (*See, e.g.*, Applicants' Spec., p. 5, lines 20-22, and p. 15, Table 1).

"Close contact" as disclosed in Shimamune and "intimate" contact as disclosed in Yoshida do not imply or indicate the claimed at least 50% contact between the geometric surface areas of a gas diffusion electrode and ion-exchange membrane having a layer of perfluorosulfonic acid polymer with a support member embedded therein. This is even more evident when one considers the voltages disclosed in the Examples of Shimamune (*e.g.*, 2.05 to 2.1 V, see, Examples 1 & 2). Applicants' inventive cells provide operating voltages of, for example, 1.16, 1.17 and 1.22 V (*see, e.g.*, Table 1 at p. 15). The voltages disclosed in Yoshida are even higher. Accordingly, Applicants respectfully submit that neither Shimamune or Yoshida teach or suggest the claimed "contact area of at least 50%" merely by reference to "intimate" or "close" contact. Such "intimate" or "close" contact can simply refer to any immediate touching as is minimally required for operation.

Moreover, there is no reason articulated on the record why one of ordinary skill in the art be motivated to specifically provide the claimed "contact area of at least 50%" ***when***

employing the claimed ion exchange membrane comprising a layer of perfluorosulfonic acid polymer with a support member embedded therein, much less with any expectation of improving operating voltage in such a cell.

Accordingly, Applicants respectfully submit that neither Shimamune or Yoshida satisfies the criteria necessary to establish *prima facie* obviousness with respect to the claimed invention, as amended herein. Furthermore, with respect to the Examiner's rejection of claims 18, 19, 21, 22, 24, 25, 27 and 29 under 35 U.S.C. as being unpatentable over Shimamune, in combination with U.S. Patent No. 4,242,184 of Ford, Applicants submit that Ford fails to remedy the deficiencies of Shimamune. Ford contains no teaching or suggestion of the claimed "contact area of at least 50%."

Even if one were to assume for the sake of argument that the cited references could somehow be interpreted to suggest the claimed invention and motivate one of ordinary skill in the art to make the combination and modifications necessary to arrive at Applicants' claimed invention, with some reasonable expectation of success, which they can not, Applicants respectfully submit that the significantly improved operating voltages of the electrochemical cells in accordance with the claimed invention are unexpected and rebut any *prima facie* case of obviousness that could arguably be established based upon the cited combination of references.

As shown in the Examples of the Specification, at page 15 in Table 1, the cells prepared in accordance with the invention have percentage contact areas of 50% or more, and achieve operating voltages lower than the prior art electrochemical cells (lower by about 100 to 300 mV). The prior art cells have surface area contact percentages of 18.0%, 8.3% and 6.5%. The results are a significant improvement over the prior art. Particularly, it can be seen from Table 1, that even where a smooth ion exchange membrane having a layer of perfluorosulfonic acid polymer with a support member embedded therein (*e.g.*, Fumatech 950) is employed but is used without a smooth gas diffusion electrode (*e.g.*, "type B) to provide the claimed contact area, *i.e.*, where the contact area is only 18%, the operating voltage is 1.28 V, compared to 1.16 and 1.22 V using the same ion exchange membrane with smooth gas diffusion electrodes such that the claimed contact area is provided.

In conclusion, Applicant submits that all pending claims patentably distinguish over the prior art of record. Reconsideration, withdrawal of all rejections and a Notice of Allowance are respectfully requested.

Respectfully submitted,

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